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ABSTRACT

Implicit communication theory (which posits that certain communication behaviors evoke emotional responses in receivers) is a plausible explanation for the teacher behavior-student learning link. An integrated approach to testing the theory is available in the form of the Continuous Attitudinal Response Technology (CART), which enables subjects to respond to continuous stimuli by turning a dial on individual hand-held devices. A pilot study used CART to test the theory. Subjects, 12 undergraduate students who had completed an introductory public speaking course, viewed a 15-minute instructional videotape on preparing a public speech and responded in terms of how much pleasure or displeasure they felt during the videotape. Subjects also answered six comprehension questions and participated in a focus group discussion. Results indicated that highest levels of pleasure occurred when the two main characters (college students preparing their speech assignments) were featured, and lowest levels occurred when a wheel-shaped model of speech preparation appeared on the screen. Both CART and the verbal response measure were useful since they answered different questions and revealed more in combination than in isolation. Comparison of the scores on the comprehension test to CART measures were inconclusive, with moderately pleasurable readings corresponding to high percentages of incorrect responses as well as correct responses. The focus group discussion served as a direct feedback mechanism. Findings offer preliminary evidence of the utility of implicit communication theory in explaining instructional phenomena. (One table of data is included; 54 references, the verbal report measure, and the comprehension questions are attached.)
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# Using CART™ in Testing Implicit Communication Theory in the Classroom

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**Abstract**

Instructional communication research provides insight into the teacher beahvior-student learning connection. However, this body of research has been criticized for its lack of a theoretical base. The authors of this paper propose implicit communication as one theory to undergird instructional communication research. Implicit communication theory posits that certain communication behaviors evoke emotional responses in receivers. Mehrabian (1981) categorized these affective states along three dimensions: pleasure-displeasure, arousal-nonarousal, and dominance-submission. In the classroom, implicit communication theory suggests that teacher behaviors translate into emotional meanings for students. We posit that emotional states occur (a) globally, as general emotional states in reaction to stimuli, and (b) moment-to-moment, as instantaneous, ongoing emotional reactions to stimuli. The global registering of an emotion can be measured via traditional research methods. However, the measurement of momentary emotional reactions require an automated feedback system. The purpose of this paper, therefore, is to: (1) briefly outline implicit communication theory as it functions in the classroom; (2) explain CART™ technology as an automated feedback system that successfully integrates research methods; and (3) report the results of a pilot study using CART™ to test implicit communication theory.

## Using CART™ in Testing Implicit Communication Theroy in the Classroom

Instructional communication scholars have produced a significant body of information in recent decades concerning what constitutes effective teaching. The evidence is clear that certain teacher behaviors have positive, direct effects on students, particularly on students' affect or attitudes in the classroom. Research has begun to document the effects of teacher behavior on students' cognitive learning as well. Several constructs (e.g., immediacy, power, teacher/student solidarity, communicator style, humor, etc.) help explain the teacher behavior-student learning connection.

However, criticism of this body of research has suggested that it has produced "laundry lists" of teacher behaviors, without an undergirding theory to explain why these behaviors produce the desired effects. While efforts have been made to confirm empirical relationships among research constructs (Andersen & Withrow, 1981; Plax, Kearney, McCroskey, & Richmond, 1986; Stewart & Wheeless, 1987), no coherent theoretical explanation has emerged to shape these research efforts into a unified or cogent theoretical perspective. We suspect that Solomon, Bezdek, and Rosenberg (1963) are accurate when they suggest that it is not a lack of research that results in uncertainty about the relationship between teacher behaviors and learning; rather, it is the lack of a theoretical framework to explain and predict relationships among teacher behavior and learning outcomes that hinders our understanding of the teaching-learning process. Staton-Spicer and Wulff's (1984) synthesis and categorization of instructional communication research led them to conclude:

> There are, however, too many isolated studies that cannot be placed into a coherent framework. Although interesting and perhaps even of practical utility, such research does not build upon a systematic structure or contribute to the development of one. What we need are integrated studies that generate propositions from which we can build theory. (p. 384).

One purpose of this paper is to propose implicit communication theory as a plausible explanation for the teacher behavior-student learning link. We also address methodological concerns in the testing of implicit communication theory. Specifically, we provide an overview of an innovative technology which constitutes an instantaneous, ongoing feedback system. The results of a pilot study testing implicit communication theory in a classroom setting via the new technology are also provided in this paper.

### Implicit Communication Theory

Implicit communication theory, as developed by Mehrabian (1981), and investigated by others (Beebe & Biggers, 1988; Butland, 1991) can serve as a common theoretical theme for instructional development research. We suggest that it is possible to conceptualize both teacher behavior variables and student outcomes in terms of implicit communication theory.

All communication systems have referents, observable behaviors, and coding rules for the association of referents and behaviors. The implicit communication system differs from the explicit system in both its behaviors and coding rules. In the explicit system (with language as the best example), behaviors are generally symbolic in nature and the rules for their association with referents are externally verifiable. Words are defined in a dictionary. Rules of construction and grammar may be referenced. The rules of association have been explicated and are socially shared (Mehrabian, 1981). Implicit communication behaviors are generally signs and the coding rules are not externally verifiable, but part of a biologically shared signal system (Buck, 1984).

Explicit communication is voluntary, in that messages are constructed, symbols are selected, and behaviors are enacted intentionally. Implicit communication is spontaneous; behaviors are more automatic or reflexive (Mead, 1934). Explicit communication is propositional, in the sense that Bertrand Russell (1903) discussed, in that generated messages can be tested for truth or falsehood. Implicit communication is nonpropositional in that behavior is an external element of an internal state and thus cannot be false. Implicit communication systems convey messages about emotions (Beebe & Biggers, 1990; Mehrabian, 1981; Zajonc, 1980).

The implicit system contains emotion/affect and attitude/preference/like-dislike referents. These referents are arranged hierarchically, so that emotion/affect is the most basic response and attitude/preference/like-dislike are higher order reactions. Implicit communication theory postulates relationships between basic emotional responses and higher order, cognitive reactions (Mehrabian, 1980; Russell, 1980).

Emotion/affect is conceptualized in terms of three factors or dimensions: pleasure-displeasure, arousal-nonarousal, and dominance-submissiveness (Mehrabian, 1976; Mehrabian & Russell, 1974; Osgood, May, & Miron, 1975; Russell, 1978; Russell & Mehrabian, 1974; 1977). Pleasure-displeasure is a feeling state ranging from extreme pain or unhappiness to ecstasy or extreme happiness. It is measured with bipolar adjectives such as happy-unhappy, pleased-annoyed, and contented-melancholic. Arousal-nonarousal ranges from states of sleep to frenzied activity and is measured in such terms as stimulated-relaxed, excited-calm, and jittery-dull. Arousal-nonarousal is a composite of alertness and activity, such that high arousal requires both physical stimulation and mental concentration. Dominance-submissiveness ranges from feelings of being in control and having mastery to feelings of being controlled and influenced. It is measured with such adjective pairs as controlling-controlled, influential-influenced, and important-awed.

Emotion/affect can then be described within the dimensions of pleasure, arousal, and dominance. Moving up the hierarchy of response, these dimensions are more recognizable as reactions of anger, anxiety, and fear. For example, anger has been described as a state of low pleasure, high arousal, and high dominance. Anxiety shares the low pleasure and high arousal dimensions, but is characterized by feelings of submissiveness (Russell & Mehrabian, 1974).

Still further up the reaction hierarchy is a more cognitive conglomerate reaction termed attitude/preference/like-dislike. Like-dislike can be predicted from the basic emotional reactions. Increased pleasure results in increased liking; conversely, increased displeasure results in increased disliking (Mehrabian, 1980).

Heightened arousal results in a stimulation of the pleasure response. If pleasure and, therefore, liking are equally high for two stimuli, then the one that elicits the greatest arousal is liked more. However, if a stimulus elicits displeasure, then greater arousal associated with that stimulus causes greater disliking. Arousal by itself offers some additive value to the liking equation, but its interactive properties are of greater importance (Mehrabian, 1980).

Dominance-submissiveness reactions operate as permission to behave. When persons feel dominant, they feel as though they may behave as they wish. Conversely, when people feel submissive, they sense that they must restrict their behavior. Feelings of dominance then produce a wider range of behavior, while a feeling of submissiveness acts to restrict variability (Biggers & Rankis, 1984). Thus, feelings of dominance will increase liking of pleasurable, arousing stimuli and increase disliking of displeasurable stimuli. Feelings of submissiveness will result in the truncation of both liking and disliking responses (Mehrabian, 1981).

The liking-disliking reaction predicts a generic set of behaviors conceptualized along an approach-avoidance continuum. The underlying concept here is so simple as to be axiomatic. People approach things that they like and avoid things that they dislike. Approach-avoidance subsumes movement toward as opposed to away, degree of interest and exploration of an object, any positive expression of preference, increased contact, or duration of stay. Moving physically closer to an object is approach, as is a more positive evaluation on a pencil and paper measuring instrument (Mehrabian, 1981).

**Instructional Applications of Implicit Communication Theory**

Implicit communication theory suggests that teacher behaviors communicate messages along the three continua of emotion. Pleasant facial expressions and vocal qualities generate pleasurable feelings in students. Frowning, glaring, angry, disgusted, fearful, sneering, smirking, or mocking facial expressions and unhappy, disgusted, or angry vocal tones indicate displeasure (Eibl-Eibesfeldt & Hass, 1967; Ekman, Sorensen, & Friesen, 1969; Hass, 1970; Tomkins, 1962; Vine, 1973).

Verbal content can also communicate pleasure or displeasure. Increased criticism, complaint, disagreement, use of exclusive language, and decreased verbal reinforcers indicate displeasure (Riskin & Faunce, 1972; Weiss, Hops, & Patterson, 1973). Verbal activity cues range from rapid, animated, loud speech to slower, less animated speech to occasional monosyllabic utterances to silence. Highly aroused emotions like anger and fear are associated with higher speech rates, greater volume, and more variability of intonation (Davitz, 1964; Eibl-Eibesfeldt & Hass, 1967; Gitin, 1970; Mehrabian & Ksionzky, 1974; Sherer, 1977).

Dominance is conveyed with behaviors which indicate strength, comfort, relaxation, and fearlessness. Submissiveness is indicated by behaviors which imply weakness, smallness, discomfort, tension, and fearfulness. In social interactions, dominant people assume positions of postural relaxation (McGinley, LeFerve, & McGinley, 1975; Mehrabian, 1969; 1972).

Approach is a higher order behavioral response, since it requires all three dimensions of emotion to be explained. Certainly a teacher would have to feel some pleasure to approach a student or class, but without some arousal and dominance no behavior would take place. The inference of meaning from approach behaviors is a relatively straightforward process, since the relationship of approach to liking is known. Greater approach indicates greater liking, as well as greater pleasure, arousal, and dominance.

Immediacy provides the clearest illustration of a potential connection between implicit communication theory and constructs that explain the teacher behavior-student learning link. All of the constructs under the rubric of immediacy suggest that teacher approach behaviors communicate messages of liking (Andersen, 1979; Andersen & Andersen, 1982; Andersen & Andersen, 1987; Andersen, Norton, & Nussbaum, 1981). Some researchers suggest that teachers' communication of liking increases students' affective and/or cognitive learning (Christophel, 1990; Gorham, 1988; Gorham & Christophel, 1990; Gorham & Zakahi, 1990; Ivy & Butland, 1989; Kearney, Plax, & Wendt-Wasco, 1985; Powell & Harville, 1990; Richmond, Gorham, & McCroskey, 1987; Sanders & Wiseman, 1990). In terms consistent with implicit communication theory, teacher approach behaviors elicit student approach behaviors, both toward the teacher and course content. In essence, a teacher's immediate behavior results in a pleasurable, liking, aroused, dominant, emotional response in his/her students. The notion that this implicit reaction to teacher behavior stimulates learning is plausible and testable.

A few recent studies provide initial support for implicit communication theory as a paradigm for explaining the effects of teacher behavior in the classroom. Gorham (1988), for example, incorporated Mehrabian's theoretical work into her research on the link between teacher verbal and nonverbal immediacy and student learning. However, Mehrabian's dimensions of pleasure, arousal, and dominance were not directly tested, i.e., more traditional immediacy terminology and behaviors were emphasized in her study. Upon documenting a relationship between teacher immediacy and student learning, Gorham concluded "immediacy items identified in this study are intuitively compatible with Mehrabian's (1981) approach-avoidance metaphor. Within this frame, the relationship of verbal (and nonverbal) teacher immediacy behaviors to affective learning which is supported by this study is patently logical" (p. 52).

The most direct test of implicit communication theory was conducted by Butland (1991). This study replicated Gorham's (1988) research, but also measured students' emotional responses to teacher immediacy behavior in implicit communication terms (Mehrabian's approach-avoidance metaphor). Results of the study replicated Gorham's (1988) findings, significantly linking teacher verbal and nonverbal immediacy to gains in student learning. However, when immediacy constructs were replaced with scales tapping the dimensions of pleasure, arousal, and dominance, results were

more illuminating. Student responses on pleasure and arousal scales accounted for over one-half of the variance of learning in this study. The combined results for immediacy and for pleasure and arousal dimensions only increased the variance explained by two percent (52% total variance explained). Thus, Butland (1991) provides evidence to document the explanatory power of implicit communication theory with regard to the teaching-learning relationship. Teacher behavior appears to affect students emotionally, and students' emotional responses to teachers are linked not only to perceptions about the teacher, but also to the amount of learning that occurs.

**CART™ and Implicit Communication Theory**

A basic tenet in research methodology is "let the question determine the method." In other words, choice of method of inquiry and the means for interpreting results should follow a thorough understanding of the question or problem. On occasion, however, studies appear to be method-driven rather than question-driven. Once a particular design or method of inquiry is learned and practiced, that method becomes comfortable, often leading to its exclusive use independent of the particular demands of the question. Kaplan (1964) has labeled this behavior "The Law of the Instrument". Several problems emerge from such a practice -- one especially germane to the current discussion. Exclusivity in research method causes researchers to overlook potential advantages of an integrated approach, thus decreasing the reliability and generalizeability of results and precluding a fuller account of the phenomenon in question.

When attempting to test a theory that explains teacher behavior and student learning, integrated research methods are preferable. Such an integrated approach to research is available in the form of newly developed technology, i.e., Continuous Attitudinal Response Technology (CART™). For testing implicit communication theory, CART™ is a solution to a problem. The traditional pencil and paper method merely taps a global or more holistic emotional reaction to a stimulus. The problem is that such a measurement represents a small "piece of the pie" within implicit communication theory. Likewise, asking subjects to recall what they felt at a previous moment in time engages a cognitive filtering process several steps removed from the actual emotions registered at the time. In addition to global/holistic responses, emotional reactions occur instantaneously in an ongoing fashion. Traditional research methods cannot measure instant responses over time, a research problem countered by CART™.

The CART™ system enables subjects to respond to any continuous stimuli (e.g., television commercials, live lectures or presentations, campaign slogans, etc.) by turning a dial or by pressing buttons on individual hand-held devices. At intervals as frequent as one per second, subjects' responses are fed into a microcomputer with customized software designed to analyze and output responses (Javidi, Long, Vasu, & Ivy, 1991; Javidi, Schrag, Long, Vasu, & Hughes, 1990; Vasu, Long, & Hughes, 1991).

A typical CART™ session is similar to the traditional focus group experience. In a classroom setting conducive to small group interaction, for example, a moderator gives subjects procedural instructions and trains them in the use of the hand-held devices. Providing warm-up questions and video/audio stimuli during the training session allows subjects time to practice and become comfortable with the system.

After this training, subjects respond to demographic and/or psychographic questions entered a priori into the computer and results are transmitted to a video monitor. For example, instead of asking subjects to indicate their sex on a printed questionnaire, subjects simply read the question on a television screen and then indicate an answer by punching a 1 or a 2 on the hand-held device. Responses give researchers the opportunity to categorize demographics before the actual dialing process begins. These categories become part of an overlay tape that is created when dialed or continuous reactions to stimuli are collected. The particular stimulus is then presented to subjects who respond by dialing on the hand-held devices.

Quantitative Output

CART™ produces a combination of continuous curves, response category bar graphs, the significance level of difference plots, and options for numerical output (e.g., frequencies, means) by individual or crosstabulated demographic categories. These outputs are immediately superimposed over the stimulus (usually on videotape) for researchers and for visual playback to subjects.

Qualitative Output

Once the stimulus has been presented and subjects have completed the dialing process, a playback/debriefing session is useful. The technology has developed to the point that a continuous measurement and display of responses both in aggregate (all subjects) and subgroups (e.g., men and women; age subcategories) can be shown to subjects. The group's mean response appears as a moving graph overlaid on the stimulus. This technique represents a form of "instant feedback polling" in which subjects review their reactions to various aspects of the stimulus and are probed concerning their motives for given responses (Javidi, Long, Vasu, & Ivy, 1991).

Combining CART™ with such traditional research methods as pencil and paper instruments, surveys, or comprehension tests produces a wealth of information not possible with one method in isolation. A description of a pilot study that tests implicit communication theory in a classroom setting through an integration of CART™ and traditional research methods follows.

## A Pilot Test of Implicit Communication Theory via CART™

The pilot study sought to: (1) determine subjects' emotional responses to a stimulus via the CART™ system; (2) compare subjects' responses produced by CART™ with responses to Mehrabian's (1981) Verbal Report Measure of the Pleasure Dimension of Emotional State; and (3) compare subjects' responses graphed by CART™ to their answers on a comprehension test following the videotape. A final goal of the study involved probing subjects for insight into why they responded to the tape as they did.

### Methods

#### Subjects

Twelve undergraduate students, four women (33%) and eight men (67%), who had completed an introductory public speaking course volunteered to participate in the study. Two-thirds of the subjects were between the ages of 17 and 22; one-third were 23 years of age and older. Subjects were predominantly sophomore, non-communication majors.

The small sample size reflects both the nature of the study (a pilot) and an initial limitation of CART™. At the time of this data collection, the CART™ system contained only 16 hand-held devices. A subsequent project involves hard wiring 10 Sprint rooms across the country, supplying each room with 16 hand-held devices, such that subjects' responses to stimuli can be transmitted via phone lines to the central computer for analysis. Thus, while the limited number of hand-held devices represents a limitation for the present study, this problem can be eliminated for future studies. The system has the potential to utilize enough hand-held devices to accommodate large subject pools, at one central location or at locations nation-wide.

#### Measurement of Pleasure Response via CART™

For this study, the researchers, because of the technology, decided to measure only the pleasure-displeasure dimension of implicit communication theory. While a subject views a stimulus, he/she dials on the hand-held device from far left (a zero point) to far right (10, 100, 200 or any predetermined number that suits the research purpose). Thus, a subject can only respond to one emotion or dimension at a time. In other words, subjects cannot view a stimulus and dial a value for pleasure, arousal, and dominance simultaneously. To tap all three emotional dimensions, one would have to either (a) show the same stimulus to the same group of subjects three times, asking them to dial their reaction for one emotion at a time or (b) use three subjects groups, one per emotional dimension. Given the pilot nature of this investigation, the decision was made to measure the pleasure dimension only.

Training and Demographic Responses

Subjects sat in a horseshoe configuration of seats in a classroom, holding the dialing devices that were wired into a central computer located in a private, back section of the room. Before viewing the instructional videotape (stimulus for the study), subjects practiced dialing the hand-held devices in response to brief commercials displayed on the video monitor. When the moderator was certain that subjects were comfortable with the devices, they were asked to respond to four demographic questions that appeared on the video monitor: sex, age, classification, and major (communication vs. non-communication major). Subjects used the section on the device where one punches in a letter (A through H) corresponding to an answer. This demographic information was transmitted to the central computer for subsequent analysis.

Stimulus Procedure

The moderator then explained that subjects would be viewing a 15-minute instructional videotape on preparing a public speech. As they watched the tape, subjects were told to respond in terms of how much pleasure or displeasure they felt during the videotape. They were not to respond in terms of whether they liked or disliked certain aspects of the tape, but rather in terms of how the tape made them feel during viewing. This distinction is important in Mehrabian's implicit communication theory.

The basic premise of the instructional videotape must be described for the results of this study to be clear. The video accompanies a new public speaking textbook published by Prentice Hall, Inc. (This new text and videotape were not in use when subjects were enrolled in introductory public speaking). The video begins with a public speaking instructor discussing an upcoming speech assignment in front of her class. A narrator sets the scene by introducing two students in the class who are also roommates. One student proceeds to prepare his speech the correct way; the other student makes constant errors, repeatedly trying to find the "easy way out" of the assignment. Interspersed throughout the tape are: (1) narrations; (2) steps that are spelled out on the screen as guidelines of speech preparation; (3) scenes between the two central characters; and (4) a model in a wheel configuration, containing the main steps of speech preparation. Due to time constraints and subject fatigue factors, and given the amount of rich data produced from the CART™ system, only the first half of the 30-minute instructional videotape was shown to subjects.

As subjects were dialing their responses, the CART™ system graphed their mean responses according to subgroupings by sex and later by age. Subjects conceptualized their dialing in terms of a midpoint or straight up on the dial (5) as a moderate level of pleasure, all the way to the left (0) as low pleasure, and all the way to the right (10) as high pleasure. The CART™ computer software recorded responses on a scale of 0 to 200. The graph produced from subjects' dialed responses appeared to the researchers in the back section of the room on a video monitor as an overlay of the instructional videotape. In this way, researchers were able to see what the subjects were responding to on the tape, as well as how they were responding.

Measurement of Pleasure Response via Scale

Once the dialing session was complete, Mehrabian's (1981) bipolar adjective scale for the pleasure dimension was presented to subjects on the video monitor (see Appendix A). Reliability estimates for the pleasure scale have been reported at around .73 (Beebe & Biggers, 1988; Biggers, Beebe, & Masterson, 1984; Mehrabian & Russell, 1974). Rather than tapping subjects' emotional responses every second during the video, this scale tapped a global emotional reaction to the video. For each set of adjectives, subjects punched the letter on the hand-held device that corresponded to their overall reaction. The subjects' range of response was from one to seven; the higher the number, the greater the pleasure experienced.

Comprehension Questions

Following the pleasure scale, six multiple choice questions were shown to subjects on the video monitor (see Appendix B). These questions tested the subjects' comprehension of material specific to the videotape. Again, subjects used the device to punch in their response to the questions. The scoring of the pleasure scale, as well as the multiple choice items, was accomplished via the computer contained within the CART™ system.

Focus Group Discussion.

Finally, researchers led an informal group discussion with subjects; this discussion was videotaped for further analysis. One of the main advantages of CART™ is the instantaneous feedback mechanism that shows how subjects respond to a stimulus. Before subjects leave a research site or begin to think of other things, researchers can conduct a focus group-type debriefing discussion, showing subjects the stimulus with graph overlay and probing for explanations of responses. In our study, researchers viewed the videotape and graph overlay with subjects, stopping the tape at various points and asking subjects what caused them to respond.

## Results and Discussion

Pleasure Responses via CART™

As the CART™ system graphs subjects' responses to a stimulus, researchers attend to peaks and valleys in the graph as indicants of greatest change in subjects' responses. In reviewing both a computer print-out of mean responses per second and the graph overlay on the stimulus in this pilot study, a pattern of subject response was detected.

Subjects began their responses from a midpoint (straight up) on the hand-held devices. Upon the appearance of the instructor character in the opening seconds of the tape, mean responses began to drop, indicating a decreasing level of pleasure. This trend leveled off during an introductory

narration, dropped even lower with the appearance of the objectives of the tape spelled out on the screen, and then began to rise sharply. The subjects dialed significantly higher levels of pleasure upon the appearance of the two main characters in the tape -- college students preparing their speech assignments. When a scene depicting these two characters ended and either narration, guidelines, or the wheel-shaped model of speech preparation appeared on the screen, subjects dialed lower levels of pleasure. Pleasure levels again rose when the two characters returned to the screen, especially when the student who attempted to cut corners on his assignment was featured.

The subjects' highest mean response per second to the video was 144, meaning that subjects were about halfway to the right from the midpoint on the dial, between five (100 to the computer) and 10 (200 to the computer). The corresponding stimulus in the videotape was an exchange between the two main characters, with an especially humorous line spoken by the "goof off" character. Subjects' lowest mean response per second to the video was 53, meaning that subjects were about halfway to the left from the midpoint on the dial, between five (100 to the computer) and zero. At this valley in their responses, the video displayed the wheel-shaped model of steps in speech preparation.

Female subjects' mean pleasure responses only differed dramatically from those of their male counterparts at one particular point in the tape. Female subjects' expressed a decrease in pleasure (from means around 100 to means around 70) upon prolonged viewing of the two male characters toward the end of the 15-minute tape. No differences were detected according to age subgroups.

Pleasure Responses via Scale

Subjects' global responses of pleasure upon viewing the videotape were assessed with Mehrabian's (1981) Verbal Report Measure of the Pleasure Dimension of Emotional State (see Appendix A). The highest mean pleasure response from a subject on the one-to-seven point scale was 5.5, indicating a relatively high amount of pleasure induced by the videotape. The lowest mean pleasure response from a subject was 3.3, indicating a slightly less than moderate level of pleasure induced by the tape. The grand mean was 4.35 or a slightly higher than moderate level of pleasure in reaction to the stimulus as a whole.

Comparing CART™ and Pleasure Scale Results

We see no reason to argue which type of information is more accurate or helpful in terms of understanding implicit communication theory. To the contrary, both forms of information are useful in that they answer different questions and reveal more in combination than in isolation.

Prior to the development of an automated feedback system such as CART™, a predominant research method was to administer an instrument after the presentation of a stimulus to measure the variable in question. As stated in an earlier section of this paper, such a global measurement is of value when seeking to understand a phenomenon in a more general way. However, when one

wants to determine instantaneous, ongoing responses of subjects to stimuli, one must measure the response in a continuous fashion over time. This method is preferable to asking subjects to recall what they felt at a past moment--a method that filters emotions through cognitive processes. Continuous measurement is also preferable to inferring from responses on an instrument that subjects must have been thinking or feeling something in particular, since they responded in kind.

From the pleasure scale, we discovered that subjects experienced moderately high levels of pleasure from the 15-minute instructional videotape. However, an instructor (no less a video producer and publisher) would want to know not only if the stimulus was generally pleasurable, but which points in the tape induced more pleasurable feelings in viewers than others and why. If students react with positive emotions to action and human interaction and with negative ones to charts, models, or enumerated steps, an instructor might rethink his/her instructional aids. The producer of the videotape would likely decide to minimize the appearance of displeasing stimuli, maximizing the exposure of more pleasurable aspects.

With regard for the benefits of combining methods for a better understanding of implicit communication theory, another methodological lesson was learned from this pilot study. We posit that emotions are elicited and, thus can be measured, in both global and specific or momentary ways. For example, an unpleasant episode with a significant other likely leaves both parties feeling angry or, in implicit communication terms, feeling low levels of pleasure. This emotional state reflects the more global nature of emotion. However, during the unpleasant episode there may be moments of neutrality, followed by extreme anger, followed by laughter, etc. These occurrences reflect the more specific, momentary nature of emotion. To provide a thorough picture of the phenomenon in this situation, combined global and momentary research methods are warranted. Replacing this example with an instructional one, it would be valuable to know which is more directly linked to student learning -- the more globally produced emotion, such as produced at the end of a lecture or a unit, or momentary emotional reactions, such as responses to teacher questions or class discussion during a particular session.

Scores on Comprehension Questions

Table 1 displays the percentages of subjects responding correctly and incorrectly to six multiple-choice comprehension questions reflecting the content of the videotape. Across from these percentages is the mean dialed response for all subjects at the point in the tape corresponding to the material reflected in each test question. The means were calculated by locating the introduction of the material on the tape, adding the mean responses for each second that the topic was discussed on the tape until another topic was introduced, and then dividing the total mean responses by the number of seconds in that period on the tape.

The relationship between the mean pleasure response and accuracy in answering question one was interpreted as an artifact of the procedure in this study. Subjects were intently engaged in the stimulus, especially in the first few minutes of viewing, which likely accounts for the high percentage of

**Table 1** - Comprehension Questions and Corresponding Mean Responses

| Question | % Correct | % Incorrect | Mean Response via CART™ (0 to 200) |
|---|---|---|---|
| In the beginning of the videotape, what did the instructor say about nervousness in speechmaking? | 83 | 17 | 80 |
| What was the main goal or objective of the videotape? | 25 | 75 | 94 |
| In the wheel-type model of speechmaking, what appears in the core? | 8 | 92 | 66 |
| According to the video, three tests of a good topic include . . . | 33 | 67 | 113 |
| According to the video, what is the next step after selecting the topic? | 75 | 25 | 106 |
| The video defines a speech purpose as . . . | 33 | 67 | 124 |

correct answers to the test question over this content. By orienting themselves to the stimulus, subjects did not stray far from the midpoint on the dial, the pre-set designation at the start of the tape. Pleasure decreased only slightly below the midpoint during this segment.

A clearer pattern was detected from an inspection of results for questions two, three, and five. Subjects expressed a moderate level of displeasure during narration accompanied by the objective of the videotape "to enable you to distinguish between effective and ineffective speeches" spelled out on the screen. Question two addressed this objective and 75% of the subjects answered this question incorrectly. Likewise, but more dramatically so, 92% of subjects missed question three which asked what appeared in the core or hub of the wheel-type model of speech preparation. Pleasure responses were at their lowest points in the entire study when students viewed this model on the screen (66 out of 200, mean response for the segment depicting the model; 53 out of 200, the lowest mean response for any one second of the entire stimulus). Question three presented the most direct

indication of a relationship between subjects' emotions experienced during the viewing of the stimulus and their comprehension of corresponding content.

Question five addressed the next step after selecting a speech topic. When this content was introduced in a conversation between the two main characters in the videotape, subjects responded with a mean pleasure level of 106 (slightly above the midpoint or moderate level). Seventy-five percent of the subjects answered question five correctly, further demonstrating a potential link between subject emotional response and retention/recall of content.

However, questions four and six did not exhibit such a pattern or relationship. The subjects indicated moderately high levels of pleasure during segments in the tape that explained the content covered in questions four and six, but 67% of the subjects answered both questions incorrectly.

Other factors must be considered in an interpretation of these results. First, we did not attempt to measure the subjects' specific prior knowledge of public speaking. We assumed a general level of understanding, since subjects had completed an introductory public speaking course. However, the videotape stimulus in the pilot study was not shown to students as part of their public speaking course. The comprehension questions were constructed to reflect specific terminology from the videotape. However, given subjects' prior exposure to the speechmaking process, it is possible that some of this knowledge was reflected in their answers to the comprehension questions. We posit that the potential bias of prior knowledge only minimally affected subjects' comprehension, since the highest score on the test was 67%.

Second, the small sample size and limited number of test questions precluded any estimations of test reliability or of item difficulty. Certain items simply may have been more or less difficult to answer, thereby creating a confounding variable in the relationship between pleasure and test performance.

A third interpretation is related again to an artifact of CART™ and the research process in this pilot study. Subjects participating in CART™ research experience somewhat heightened activation, simply because they are operating the hand-held devices, rather than engaging in a more traditional form of research. Perhaps subjects in this pilot study so focused their attention to dialing their responses of pleasure-displeasure, that they distracted themselves from the content of the tape. The subjects' test scores also support this interpretation. Further research is necessary to more clearly determine the effects of such artifacts currently inherent in the use of CART™, as well as ways to counter confounding variables.

A final consideration relates to the decision for this pilot study to only tap one of the three dimensions of implicit communication theory. Perhaps future studies measuring pleasure, arousal, and dominance will determine a more direct relationship between response and comprehension of content.

Focus Group Discussion

During this discussion, the videotape was replayed on the television monitor with the graphed responses of subjects by sex subgroups appearing as an overlay. Subjects viewed changes in the mean responses corresponding to varying aspects of the videotape. When a significant change in the graph appeared, indicating either a peak or valley in subjects' level of pleasure, the researchers paused the tape and asked subjects to explain their responses. In pilot testing this process, we found the opportunity to debrief subjects, view the tape and graph overlay with them, and hear their explanations for their responses to be one of the most insight-producing aspects of the study.

Subjects explained that, initially, they experienced heightened activation because of the use of the hand-held devices. They reported that both a sense of "importance" regarding their input into this research and exposure to the innovative technology heightened their attention levels to the stimulus. However, they also agreed that this heightened activation subsided fairly quickly as the videotape progressed.

The remaining portion of the discussion surrounded subjects' explanations as to why certain aspects of the tape gave them pleasure or displeasure. In general, they experienced high degrees of pleasure when the two male characters appeared because "They were real," "It showed students as they really are, when it comes to getting a speech ready," and "That one guy was just really funny." Likewise, the objectives, steps of speechmaking spelled out on the screen and especially the wheel-type model "turned me off" and were seen as "typical teacher-type stuff that you're supposed to know, but is really boring."

Subjects continued to offer explanations for their responses throughout the replay of the tape. At the one point when the graphs for sex subgroups were significantly divergent, we quizzed the female subjects as to their declining pleasure levels. They remarked that they had seen enough of the male characters and the "right way, wrong way" story line, such that it became less pleasurable to watch. Discovering subjects' reasons behind their responses adds a depth of insight beyond the other information that CART™ produces. This process is equivalent to having a discussion with each subject who completes an instrument or survey as to his/her motivations or reasons for responding -- a procedure rarely exercised in research. The focus group discussion not only gives a researcher a more sound basis for interpreting results. It serves as a direct feedback mechanism when one wants to determine the usefulness of a particular instructional device or strategy, or revise a stimulus, such as a lecture, model, videotape, etc. The producer of this videotape, for example, would have learned not only what elements of the tape were pleasurable and to what degree they were pleasurable, he/she would have learned why the stimulus induced the emotion.

## Conclusions, Applications, and Directions for Future Research

This pilot study offers preliminary evidence of the utility of implicit communication theory in explaining instructional phenomena. More research is necessary to establish the three-dimensional nature of implicit communication theory as a viable explanation of the teacher behavior-student learning link. The study also demonstrates the necessity of an automated feedback system as the method for tapping instantaneous, momentary, and ongoing emotion in subjects. Future studies require expanded subject samples, inclusion of the three dimensions of implicit communication theory, and variant stimuli. We believe that comparing the results from such a system as CART™ and those produced by traditional research methods is a fruitful, worthwhile practice to receive a more complete picture of phenomena documented by instructional communication research, as well as to understand why variables lead to certain outcomes. Past research has exposed the what and the how of communication in the classroom; implicit communication theory tested via CARTtm offers the why.

The practical implications of the combined methods and the results in this pilot study are vast. Suppose that an instructor wished to determine the points in a given lecture that induced the greatest levels of pleasure, arousal, and dominance in students. Perhaps a series of lectures could be tested, with a subsequent inspection of students' comprehension of course material via a midterm examination. Instructors might discover that their "favorite" lectures actually do not produce emotional reactions in students, and, in relation, fail to enhance their learning of course content. Knowing where students experience "peaks and valleys" emotionally in a classroom would certainly be powerful information for the development of instructional materials.

Another practical application of this knowledge relates to teacher training. Not only could a trainer pre-test a training package for a multitude of reactions from subjects, the information contained in the package itself could be enhanced from such research as conducted in the pilot study.

Regarding future research efforts in this vein, teacher immediacy behaviors, for example, could be measured in a momentary, ongoing fashion, rather than as global reactions to teacher behavior. Instantaneous responses of students could be compared to recalled perceptions of immediate instructors or to frequencies produced from an observer who counts immediate behaviors in a classroom or codes them from videotapes. Similar studies combining the CART™ system with traditional research methods and involving such constructs as teacher power, clarity, solidarity, and dramatic style behaviors would greatly enhance our understanding of the effects of these variables on student learning. These studies would offer illumination as to why these constructs have the power to affect learning. One such study on the effects of teacher narrative activity on student learning has been recently conducted (Schrag, Long, Javidi, & Vasu, 1991). Moreover, instructional variables could be couched in terms of implicit communication theory, to further investigate its utility. Constructs that pervade instructional communication research need to be reexamined by incorporating terms of implicit communication theory and by integrating research methods.

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**Appendix A** - Verbal Report Measure of the Pleasure Dimension of Emotion State

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|
| Happy | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Unhappy |
| Pleased | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Annoyed |
| Satisfied | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Unsatisfied |
| Contented | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Melancholic |
| Hopeful | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Despairing |
| Relaxed | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Bored |

**Appendix B** - Comprehension Questions

1. In the beginning of the videotape, what did the teacher say about nervousness?

   A. It is unnatural; learn to control it.
   B. It is natural, but is reduced with time.
   C. It is due to an overly positive amount of energy.
   D. It is natural; learn to channel it into positive energy.

2. What was the main goal or objective of the videotape?

   A. to affect an audience
   B. to distinguish between effective and ineffective speeches
   C. to select a speech topic, purpose, and support material
   D. to develop good delivery skills

3. In the wheel-type model of speechmaking, what appears in the core?

   A. the speaker
   B. topic selection
   C. audience analysis
   D. the type of speech

4. According to the video, three tests of a good topic include

   A. your interests, knowledge, and audience attitude.
   B. your opinions, the occasion, and time limits.
   C. the audience, the occasion, and your interests.
   D. audience interest, attitude, and knowledge.

5. According to the video, what is the next step after selecting the topic?

   A. Select an organizational pattern.
   B. Find supporting materials.
   C. Determine your method of delivery.
   D. Develop your main ideas and subtopics.

6. The video defines a speech purpose as

A. the outcome desired from an audience.
B. the same thing as a central idea.
C. a summary of your argument.
D. a general outline of your main points.